

## Research Article

DOI: 10.15740/HAS/AJSS/11.1/197-201

# Forms and status of sulphur availability in soils of Mizoram

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Received : 28.01.2016; Revised : 20.04.2016; Accepted : 16.05.2016

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### Summary

Block level samples were collected from surface (0-15 cm depth) soils under major land use systems of Mizoram. Different forms of sulphur, their availability status were inventorized. Surface samples from all the RBDs of Mizoram were analyzed developed under different land forms and land use. Thirty six per cent soils sampled were medium in available sulphur status (10 ppm - 30 ppm). Thirty five per cent soils sampled were found to be low in available sulphur (<10ppm). Twenty nine per cent soils sampled were found to be high (>30ppm). Status of available sulphur was found to be medium in most of the soils.

**Key words :** Forms of Sulphur, Availability

**How to cite this article :** Brajendra, Vishwakarma, A.K. and Sarma, Meghna (2016). Forms and status of sulphur availability in soils of Mizoram. *Asian J. Soil Sci.*, **11** (1) : 197-201 : DOI : 10.15740/HAS/AJSS/11.1/197-201.

## Introduction

Mizoram is a hilly terrain lying in the Eastern-most corner of India. Mizoram has an area of 2.109 million ha and lies between 92° 15" to 93° 29" E longitude and 21° 58" to 24° 35" N latitude. It has a sub tropical and humid climate, which favours the growth of a large number of agri-horticultural crops. The physiography of Mizoram is divided into hills, valley and flat lands. The shape of Mizoram is oblongated and surface is highly undulating. Low soil pH and high Fe and Al oxides concentration are the striking features of Alfisols and Ultisols of Mizoram. These soils can absorb large amounts of sulphur and then release it in a speed which may not match the plants absorption (Ajwa and Tabatabai, 1993). Sulphur unlike nitrogen, occurs in soils in organic and inorganic forms, the former fraction often like N, constituting more than 95 per cent of the total S in most soils of the humid and sub-humid regions (Frenay, 1961). The great

variations in the age and character of the soils parent materials in the tropics gives rise to a wide variety of soil types with different proportion of S fraction (Sharma *et al.*, 1988). Extensive studies have been conducted on the nature of organic S and its mineralization to serve as a reserve for the supply of plant available S (Singh *et al.*, 1993). Hardly any information is available on the nature of other forms of S under different land use systems for all the districts of Mizoram. The objectives of this study, therefore, were to assess the status, nature and distribution of S in different land use systems of Mizoram.

## Resource and Research Methods

Surface soil samples (0-15 cm depth) were collected in each and every block of all the districts of Mizoram. The collected samples belonged to major land use systems of Mizoram, The collected samples were

air-dried after mixing it thoroughly. The air dried samples were passed through 2mm sieve. The samples were analysed for some soil characteristics. Several forms of sulphur such as total S, inorganic S, adsorbed S, organic S and available S were determined by following standard procedures. The sulphur availability index for each soil was worked out. Based on their availability index value, the soils were grouped into 3 categories viz., low (< 6.0), medium (6-9) and high (> 9.0). Simple correlation and step wise multiple regression analysis were worked out by standard statistical methods.

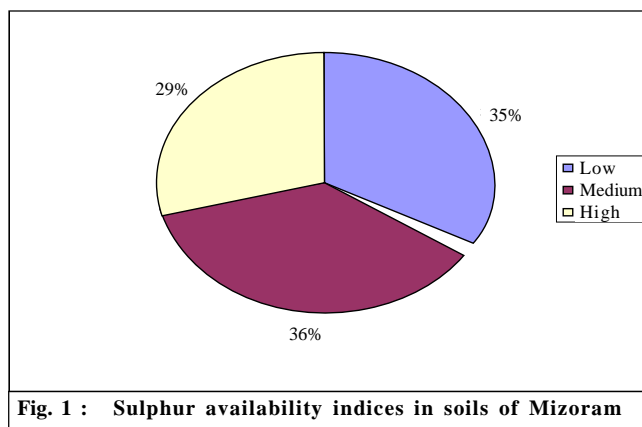
## Research Findings and Discussion

The results obtained from the present investigation as well as relevant discussion have been summarized under following heads :

### Availability of S :

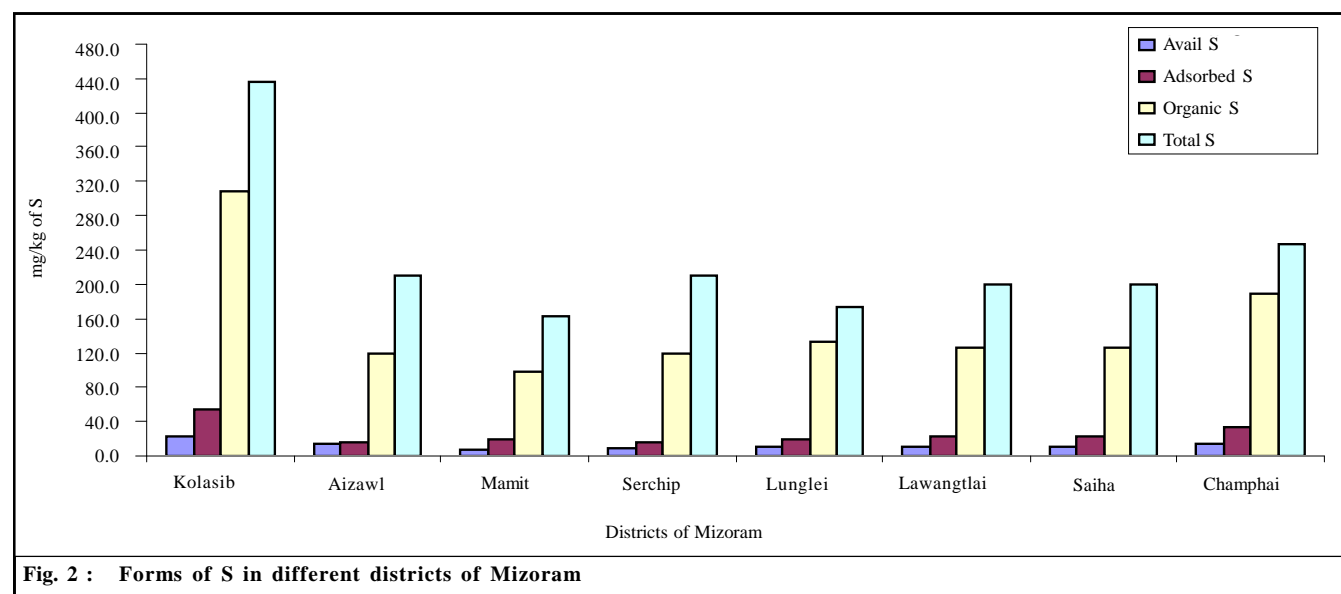
Blockwise S status reveals that soils varied widely in their availability. Thirty six per cent soils sampled were medium in available sulphur status (10 ppm - 30 ppm). Thirty five per cent soils sampled were found to be low in available sulphur (<10ppm). Twenty nine per cent soils sampled were found to be high (>30ppm). Status of available sulphur was found to be medium in most of the soils. However, in most of the soils this range was marginally in the optimum level and sulphur deficiency is more likely to occur in Mizoram in time to come. Due to most of the soils being light in texture and highly permeable, sulphur availability indices was

determined ( Fig.1 and 2).



### Inorganic sulphur :

The content of inorganic S was found to vary from 34.39 to 81.14 ppm in Kolasib district with a mean value of 54.80 ppm, which ranged from 9.02 to 30.24 ppm in Mamit district with a mean value of 18.57 ppm, which ranged from 18.30 to 42.82 ppm in Aizawl district with a mean value of 25.40ppm, which ranged from 8.98 to 21.93 ppm in Serchip district with a mean value of 15.72ppm, which ranged from 8.88 to 49.40 ppm in Lunglei district with a mean value of 19.63 ppm, which ranged from 17.12 to 31.03 ppm in Lawangtlai district with a mean value of 22.75 ppm, which ranged from 14.26 to 32.23 ppm in Saiha district with a mean value of 22.75 ppm, which ranged from 17.81 to 47.59 ppm in Champai district with a mean value of 33.89 ppm (Table 1).



<b>Table 1 : Different forms of S in soils of Mizoram</b>								
Place/village	Land use	OM	pH	Available S	SAI	Adsorbed S	Organic S	Total S
<b>Kolasib</b>		(%)		ppm		ppm	ppm	Ppm
Vairengte	Arecanut	2.44	5.09	14.17	Medium	35.43	184.21	233.81
Saipui	WRC	1.12	5.89	18.15	High	41.75	245.03	306.74
Chempai	WRC	1.34	5.95	19.21	High	40.34	240.13	363.07
Meidum	WRC	1.69	6.14	27.28	High	70.93	313.72	488.31
Bhuchang	WRC	0.40	5.92	14.33	Medium	34.39	179.13	272.27
Bairabi	WRC	1.09	6.08	14.90	Medium	40.23	202.64	296.51
Bualpui	Banana	3.07	4.79	31.81	High	67.44	438.98	559.86
Kawnpui	Banana	2.17	5.09	35.17	High	70.34	488.86	668.23
Thingdawl	Citrus	2.10	4.84	30.05	High	81.14	416.19	598.00
Hartuki	Hatkora	1.91	5.23	28.70	High	66.01	370.23	602.70
Range		0.4-3.07	4.79-6.14	14.17-35.17		34.39-81.14	179.13-488.86	233.81-668.23
Mean				23.38		54.80	307.91	438.95
<b>Mammit</b>								
Zamuang	Teak forest	2.48	5.34	7.32	Low	19.47	95.16	153.72
Saikhtlir	Bamboo	2.57	5.53	9.42	Low	20.72	122.46	183.69
Chunvel	WRC	2.02	6.65	3.76	Low	9.02	48.88	75.20
Knahmun	WRC	3.15	5.58	4.89	Low	12.71	63.57	102.20
Ruipuichip	Citrus (Declined)	1.64	4.7	5.60	Low	11.76	72.80	117.60
Tuidam	Citrus (Declined)	1.47	5.66	5.90	Low	15.93	76.70	129.80
Mamit	Citrus (Declined)	1.66	5.33	12.50	Low	28.75	162.50	275.00
Kawarthaven	Citrus (Declined)	1.66	5.52	11.20	Low	30.24	145.60	246.40
Range		2.21	5.40	3.76-12.50		9.02-30.24	48.88-162.50	75.20-275.00
Mean		1.90	5.75	7.57		18.57	98.46	160.45
<b>Aizawl</b>		1.69						
Darlawn	Terraces (veg.)	2.11	5.76	10.24	Low	19.97	133.12	179.20
Kapram	Terraces (veg.)	2.01	5.10	12.02	Medium	22.60	156.26	215.16
Sawlang	Terraces (veg.)	1.92	5.53	15.42	Medium	27.14	200.46	285.27
Sateek	Terraces	1.13	5.52	10.69	High	21.38	138.97	194.56
Sailsuk	Terraces (veg.)	2.02	5.76	14.44	Medium	24.55	187.72	245.48
Thenzawl	Terraces (veg.)	1.148	4.99	22.90	Medium	42.82	297.70	435.10
Pawlrang	Banana	1.68	5.74	18.70	High	31.04	243.10	372.13
Saitul	Citrus		5.28	13.14	High	23.26	170.82	250.97
Durtlang	Terraces (veg.)	2.17	5.71	15.18	Medium	25.20	197.34	282.35
SipHir	Terraces (veg.)	2.71	4.51	13.00	High	23.14	169.00	262.60
Sairang	Terraces (veg.)	2.72	5.29	9.68	Medium	18.30	125.84	183.92
Range		2.37	5.24	9.68-22.90		18.30-42.82	125.84-297.70	179.20-435.10
Mean		3.22	5.53	14.13		25.40	183.67	264.25
<b>Serchip</b>		2.8	5.5					
Baktawng	Passion fruit			13.79	Medium	21.93	179.27	317.17
Chingchip	Banana	2.08	6.14	10.17	Medium	16.88	132.21	225.77
New Town,	WRC	2.20	5.80	7.85	Low	14.56	102.05	158.57
Kettum	Citrus	2.75	6.05	4.74	Low	8.98	61.62	104.28

Table 1: Contd.....

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Chekawn	WRC	2.69	4.59	7.87	Medium	13.10	102.31	156.61
N.VanlalpHa	Pine forset	2.07	6.49	10.20	Medium	18.87	132.60	234.60
Range		1.92	5.91	4.74-13.79		8.98-21.93	61.62-179.27	104.28-317.17
Mean		2.25	5.38	9.10		15.72	118.34	199.50
<b>Lunglei</b>		2.27	5.74					
Sarjuplai	WRC	2.41	5.10	6.14	Low	11.64	79.82	109.91
LungpHer	Terraces			9.78	Medium	18.48	127.14	166.26
Ramtherveng	WRC	2.00	6.03	22.01	High	33.02	286.13	413.79
Chanmari	Pineapple	2.53	4.96	8.64	Medium	12.96	112.32	146.88
Thingfall	Jhums	1.52	5.95	6.37	Low	12.42	82.81	114.02
Lalreng	Jhums			19.76	High	49.40	256.88	399.15
Rotlang	Bamboo	3.83	7.24	7.82	Low	16.42	101.66	132.94
Phaireng	Teak	3.41	6.39	4.46	Low	8.88	57.98	91.88
Pungwal	Banana	4.14	5.94	7.12	Low	13.46	92.56	127.45
Range				4.46-22.01		8.88-49.40	57.98-286.13	91.88-413.79
Mean		2.37	5.19	10.23		19.63	133.03	189.14
<b>Lawangtalai</b>		2.26	5.92	11				
Sailkah	Jhums	3.1032	5.89	14.65	Medium	30.77	190.45	300.33
S.Chawnpui	Tung forest	2.66	5.42	12.41	Medium	31.03	161.33	260.61
Chongte	WRC	3.53	4.99	7.78	Low	17.12	101.14	171.16
Range		2.88	5.34	7.78-14.65		17.12-31.03	101.14-190.45	171.16-300.33
Mean				11.61		26.30	150.97	244.03
<b>Saiha</b>								
Serkawr	Jhums			8.37	Medium	21.76	108.81	171.59
Thingsen	Bamboo			14.65	High	32.23	190.45	322.30
Bualpui	Terraces			6.20	Medium	14.26	80.60	142.60
Range				6.20-14.65		14.26-32.23	80.60-190.45	142.60-322.30
Mean				9.74		22.75	126.62	212.16
<b>ChampHai</b>								
Dulte	Banana			7.13	Low	17.81	92.63	121.13
Zuatlang	WRC(Dry)			20.69	High	47.59	268.97	397.25
Tlangsum	WRC(Wet)			12.15	Medium	29.16	157.95	245.43
Vapar	Grapes orchard			14.26	High	31.37	185.38	313.72
Hnahlan	Grapes orchard			14.37	High	33.05	186.81	273.03
Khungleng	Passion fruit			18.47	High	44.33	240.11	354.62
Range				7.13-20.69		17.81-47.59	92.63-268.97	121.13-397.25
Mean				14.51		33.89	188.64	284.20

### Organic sulphur :

Though little is known about the nature of organic S compounds present in soil, its importance in respect to sulphur availability is well known. In absence of inorganic sulphur addition the form of S contribute to the available S pools. The soils of Mizoram were found to contain, an average of 307.91 ppm in Kolasib district which ranged

from (179.13-488.86) ppm, an average of 98.46 ppm in Mammit district which ranged from (48.88-162.50) ppm, an average of 183.67 ppm in Aizawl district which ranged from (125.84-297.70) ppm, an average of 199.50 ppm in Serchip district which ranged from (61.62-179.27) ppm, an average of 133.03 ppm in Lunglei district which ranged from (57.98-286.13) ppm, an average of 150.97

ppm in Lawangtalai district which ranged from (101.14-190.45) ppm, an average of 126.62 ppm in Saiha district which ranged from (80.60-190.45) ppm, an average of 188.64 ppm in Champai district which ranged from (92.63-268.97) ppm of organic S (Table 1).

#### Total sulphur :

The total sulphur content in the surface soils of Kolasib district varied with an average value of 438.95 ppm ranging from (233.81-668.23) ppm, with an average value of 160.45 ppm in Mamit district which ranged from (75.20-275.00) ppm, with an average value of 264.25 ppm in Aizawl district which ranged from (179.20-435.10) ppm, with an average value of 118.34 ppm in Serchip district which ranged from (104.28-317.17) ppm, with an average value of 189.14 ppm in Lunglei district which ranged from (91.88-413.79) ppm, with an average value of 244.03 ppm in Lawangtalai district which ranged from (142.60-322.30) ppm, with an average value of 212.16 ppm in Saiha district which ranged from (142.60-322.30) ppm, with an average value of 284.20 ppm in Champai district which ranged

from (121.13-397.25) ppm (Table 1).

#### Acknowledgement :

Authors are grateful to the Director, ICAR, NEH Umiam for the support and facilities extended for carrying out the investigation.

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